day with respect to the user A, it can be seen that similar graphs for the user A are obtained regardless of the number of times of measurement and a measurement time (however, a minute change in the feature information of the first principal component may be generated depending on the number of times of measurement for the same user, an exposure time to a single light, and a change in the measurement time, but it is noted as a function of unique characteristic information for identifying a user). At this point, the number of times of measurement and a measurement time interval may correspond to an arbitrary number, and are not to be interpreted as being limited to the above exemplary embodiments.

[0065] The Raman spectrum analyzer **230** may extract one or more pieces of data from an outline of the graph, a Raman shift of a peak point, and an intensity of peak point as the feature information of the first principal component. That is, the Raman spectrum analyzer **230** may repeatedly measure the feature information of the first principal component at an arbitrary time and verify reproducibility of the feature information of the first principal component from the measured data.

[0066] Similarly, the Raman spectrum analyzer **230** may measure the first principal component three times on a first day (B day1) and three times on a second day (B day2) with respect to the user B and extract feature information of the first principal component of the user B as shown in view (B) of FIG. **5**.

[0067] The feature information of the first principal component for each of the user A and the user B extracted by the Raman spectrum analyzer **230** may be uniquely exhibited regardless of the number of times of measurement and the measurement time for each user, and therefore may be used as the user characteristic information.

[0068] FIG. **6** is a diagram comparing graphs related to feature information of a first principal component of the user A and the user B, according to an exemplary embodiment. When graphs related to the feature information of the first principal component for each user of FIG. **5** are superimposed on one another, the outline of the graph may be obtained as shown in FIG. **6**. When the obtained graph is enlarged in a Raman shift region (cm^{-1}) of 1 to 1,800, the outline of the graph for the feature information of the first principal component of each of the user A and the user B appears different. This may be because a component composition ratio constituting the skin is different for each person, which can be confirmed by the graph shown in FIG. **6**.

[0069] The Raman spectrum analyzer **230** may extract the outline of the graph, a Raman shift of the peak point, and an intensity of the peak point from the feature information of the first principal component of each of the user A and the user B, and may analyze the extracted data as the user characteristic information. In an exemplary embodiment of FIG. **6**, the authenticator **240** may determine that the user A and the user B are not the same person based on the analysis result of the Raman spectrum analyzer **230**.

[0070] The storage **250** may store the analysis result of the Raman spectrum analyzer **230** as unique characteristic information of a user. For example, when the Raman spectrum analyzer **230** measures the Raman spectrum six times with respect to the same user and analyzes user characteristic information from the measured Raman spectrum, the storage **250** may store a mean value of the Raman spectrum and an error range or a representative Raman spectrum and a threshold range as the user characteristic information. At this point, the storage **250** may store the Raman spectrum measured for each user in a database, a look-up table, or the like, and use a hardware device such as a memory, a storage, or the like.

[0071] When the composition ratio of the principal components of the body is changed due to increase and decrease of the user's body weight, changes in diet and lifestyle, and the like, the storage **250** may track and record the changing process, and store the latest Raman spectrum analysis result as the user characteristic information.

[0072] The authenticator **240** may authenticate a user based on the analysis result. At this point, the authenticator **240** may authenticate the user's identity by comparing the analysis result of the Raman spectrum analyzer **230** and the user characteristic information stored in advance.

[0073] When the user's identity is authenticated by the authenticator **240**, the information provider **260** may process the analysis result of the Raman spectrum with respect to the authenticated user and provide information about the health status of the user. The information about the health status may be information that is described in association of the principal component composition ratio analyzed from the Raman spectrum and the feature information about the principal composition with the health status of the user.

[0074] The user authentication apparatus **200** using the Raman spectrum may perform a user authentication based on biometric information of the user in a non-invasive manner. In addition, the user authentication apparatus **200** using the Raman spectrum may perform the user authentication and provide the information about the health status of the user at the same time, and thereby may contribute to user convenience.

[0075] FIG. **7** is a flowchart illustrating a user authentication method using the user authentication apparatus of FIG. **1**. As an example, a user authentication method using the user authentication apparatus **100** according to an exemplary embodiment of FIG. **1** may include the following operations.

[0076] First, in operation **710**, the Raman spectrum analyzer **110** analyzes user characteristic information from a Raman spectrum. According to an exemplary embodiment, the Raman spectrum analyzer **110** may extract one or more pieces of data from a type of the Raman spectrum, a Raman shift of a peak point, and an intensity of the peak point and analyze the extracted data as user characteristic information.

[0077] Next, in operation **720**, the authenticator **120** authenticates a user based on the analysis result of the Raman spectrum analyzer **110**. For example, the authenticator **240** may determine whether the extracted data coincides with user characteristic information stored in advance based on the analysis result and authenticate a user's identity using the user authentication apparatus **100**.

[0078] FIG. **8** is a flowchart illustrating a user authentication method using the user authentication apparatus **200** of FIG. **2**.

[0079] First, in operation **810**, the light source **210** irradiates a user's skin with a single light. In this case, the single light may be a short wavelength light such as a laser.

[0080] Next, the Raman spectrum acquirer **220** receives light reflected from the user's skin in operation **820**, and acquires a Raman spectrum from the received light in operation **830**. At this point, as Raman light selectively emits